FCD 1954

CENTRAL INTELLIGENCE AGENCY

INFORMATION REPORT

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SECURITY INFORMATION

COUNTRY	East Germany	REPORT	
SUBJECT	Present and Future Research Projects at the Heinrich Hertz Institute, Berlin-Adlershof	DATE DISTR.	31 August 1953
		NO. OF PAGES	7
DATE OF INFO.			
PLACE ACQUIRED			

25X1

USAF review completed.

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(FOR KEY SEE REVERSE)

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Research Institute

1. The Heinrich Hertz Institute is strictly a research institute, and no series production of apparatus or components is carried on there..

Department I, Electro-Acoustics

2. The primary goal in this department was to find a suitable array of loudspeakers for use in large halls. As a result, the "circular beam groups" (Rundstrahlergruppen) as a circular array of six loudspeakers came into existence. In accordance with required power and directivity, several of these groups may be combined adjacent to or above one another. Chief Engineer FEIK was awarded an East German commercial patent (Wirtschaftspatent der DDR) for the array. The collaborator for theory on this project was Dr. SCHUENEMANN, while the entire department took part in the extensive measurements required. The speaker groups have so far been used in the culture auditorium (Kulturraum) of Bergmann-Borsig, Berlin, and at an FDJ (Free German Youth) meeting in Leipzig in the summer of 1952. The invested funds are unknown.

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25 YEAR RE-REVIEW

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(Note: Washington Distribution Indicated By "X"; Field Distribution By "#".)

25X1

3. The department is now carrying out systematic measurements of the degree of acoustic absorption of construction materials. The measurements are made in an echo room with oblique walls. Most of this work had been carried on by Ing. ODIN and Dipl. Ing. BRODHUN. It is now being performed by new engineers [redacted] In addition, this department performs consultations on acoustic room and construction problems. 25X1

4. This department has at its disposal six laboratory rooms, one acoustically dead room (Schalltoter Raum), one echo room (Nachhallraum), one sound measuring field (Schallmessfeld) in the open, and one mobile measuring van. [redacted] the department had the following equipment at its disposal: several tape recorders (AEG), oscillographs, automatic recording writing instruments (Neumann-Daempfungsschreiber), audio frequency generators, and test microphones. 25X1

Department II. High Frequency Techniques

5. The primary work of this department is in ionospheric research. The transmitting and receiving equipment required for this work is developed and built by the department itself. Dipl. Ing. DITTMAR and Ing. STADLMANN developed and built a fixed frequency pulse transmitter and corresponding receiver with a test oscilloscope, presumably in the medium wave range. With this equipment the altitude and thickness of the various ionosphere layers are determined by measuring the travel time and amplitude of the reflected pulses. The purpose of the ionospheric research is to record continuously the altitudes and thickness of the ionosphere layers, and to analyse the relationship between these data and external effects, such as weather, sun spots, etc. The end purpose of this analysis will be to determine the most favorable radio transmission frequencies. However, this data is not yet being used by the Neustrelitz branch for its predictions of favorable transmission frequencies (Funkberatungen). DITTMAR and STADLMANN also developed a varying frequency transmitter (Durchdrehsender), whose carrier frequency varies periodically between approximately 1 and 20 megacycles, with the corresponding receiver and measuring apparatus. This equipment is now being constructed.

6. Ing. STADLMANN developed and built equipment for generating a 10 kilovolt pulse, with a pulse duration of 1 microsecond and a repetition frequency of 1000 cycles, for the Institute for Crystal Physics. The 10 kilovolt pulse was to be applied to the electrodes of a quarts crystal. If the crystal is exposed to light while the pulse is applied, an electron flow is supposed to take place from the exposed edge to the center of the crystal. This work is being carried on at the Institute for Crystal Physics [redacted] 25X1

7. Ing. PRINZLER developed and built a VHF (UKW) field strength measuring and recording receiver for 40 megacycles. With this and a VHF transmitter operating in the same frequency range, and at approximately 80 watts output, directional characteristics of VHF receiver antennas are measured. The VFH transmitter (40 mc, 80 watts) was built by a small workshop in East Berlin. A similar transmitter is now being constructed at the Heinrich Hertz Institute.

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8. The Falke Company in East Berlin is also building some of the electronic equipment for the Institute, to the Institute's specifications.

9. Together with the Neustrelitz Branch, Herr LANGE is carrying out predictions on radio transmissions (Funkberatungen) 25X1
These predictions are classified Secret. 25X1
they cover only East Germany.

10. In this department, Dipl. Phys. VOLLAND has undertaken investigations and recording of the earth's magnetism, and Dipl. Ing. FUERSTENBERG has made measurements of solar radiation.

11. The department has at its disposal six laboratory rooms, the installation at the Neustrelitz Branch with which we are not familiar, and a mobile test equipment van. In addition to the usual laboratory test equipment, such as oscilloscopes, signal generators, vacuum tube voltmeters, etc., the department has a pulse oscilloscope with a writing speed of 50,000 kilometers per second, made by the "HF" Werk.

Department III. Highest Frequency Techniques

12. This department, which was called the department for "Applied Oscillation Techniques", worked on research projects in various fields, such as an echo apparatus (Nachhallgeraet), encephalograph, geotectonic measuring equipment, and magnetic field strength meters using the Hall effect in germanium. Details about these projects are not known to us. The encephalograph was developed and built at least one year ago The geotectonic equipment was to be 25X1
used as a metal detecting apparatus to find buried cables, etc. It would not be used to detect metal ores.

13. Recently the department worked exclusively on highest frequency (Hoechstfrequenz) problems, and in such fields as molecular oscillation (molecular clock), detectors, magnetrons, and ponderomotive (power) measurements on waveguides were worked on. The fields of molecular oscillations, and measurements of attenuation in gases at very short wave lengths, were worked on by Dipl. Phys. KOEPP. Dr. h.c. (honorary Dr.) PRAXMARER occupies himself with magnetron problems. Up to the present it has not been possible, however, to produce a magnetron. Dr. JUNG's work on molecular oscillations was published in the September or October 1952 issue of Nachrichtentechnik. An article by Dr. PRAXMARER on magnetron developments appeared in the same periodical at about the same time. Dr. PRAXMARER went to the USSR volunterily in 1946 25X1

14. The department has eight laboratory rooms at its disposal. In addition to the usual laboratory instruments and equipment the department possesses decimeter signal generators, fixed and rotating test lines, power meters, mostly from Sachsenwerk, Radeberg, as well as a frequency analyzer for centimeter range from the "HF" Werk. A metal punch (Stossmaschine) is available for the production of magnetrons.

Department IV. Electronics

15. In the spring of 1951 Departments IV a, Communications, and IV b, Television were united to form Department IV, Electronics. Until this time, Department IV a had been run by Dr. FEIGE, and worked on the

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research contract "Vocoder", code telephone. This project was to develop an apparatus similar to one publicized in American literature. Ing. Werner KABEL continued this project alone until the end of 1951 after Dr. FEIGE's resignation. By this time he had completed the development and investigations of the most essential components of this extensive equipment. The construction of a complete set with transmitter and receiver has not been accomplished. As far as we know, the development is being continued at the RFT Fernmeldewerk in Leipzig. A more efficient utilization of existing telephone equipment is promised by the application of this development. Twenty thousand DM East were made available for this project. Test equipment purchased for the project included: one oscilloscope, one frequency meter for audio frequency range, one audio frequency generator, one vacuum tube voltmeter, one R-C-L measuring bridge, various test amplifiers, and a tape recorder with microphone.

16. The Vocoder system divides the audio signal to be transmitted into 10 frequency bands; for instance, if a range of 300 to 3000 cycles is to be transmitted, the range is divided into 10 bands, each approximately 50 cycles wide: 300-350, 700-750, etc. When the bands are recombined, enough of the signal is retained over the 300 to 3000 cycle range that it is still understandable. The main advantage of the system is that very narrow band amplifiers may be used for each of the 10 bands.

17. Department IV b, later Department IV, worked on the research project, "Investigation of Elements of Iconoscopes", which ran from 1950 to 1952. For this project, 96,000 DM East were made available, which were used primarily for the outfitting of the department. Two vacuum laboratories, one television equipment laboratory, and a laboratory for photoelectric measurements were required for this project.

18. The project was divided into several parts. One important aspect was the manufacture and investigation of photocathodes. The requirement was to produce transparent photocathodes (Durchsichtsphotokathoden) with a great over-all sensitivity, and a spectral sensitivity distribution closely approximating the sensitivity distribution of the human eye. Primarily Sb-Cs (Antimony-Cesium) layers were made, with a sensitivity of approximately 120 microamperes per lumen. For producing these layers, antimony is first deposited on a wall of the photocell; this is then exposed to an atmosphere of cesium at a temperature between 200 and 300 degrees Centigrade, until maximum sensitivity is attained. Excess cesium is removed by combination with small amounts of oxygen to form cesium oxide. Frequently the antimony depositing process and the cesium treatment were repeated several times. However, it soon became apparent that the manufacturing method is of less significance than the layer thickness. Subsequently, systematic layer thickness investigations were carried on. For this purpose a pellet of antimony was evaporated in a cylindrical cell, so that a layer of antimony of continuously changing thickness was produced along the glass wall of the cylinder. The thickness at each point was known, and the light transparency was measured. Then the usual cesium treatment followed. The complete photocell produced interference lines in the spectrum of the transmitted light. These were measured by a second photocell. From the graphs resulting from these measurements the relationship between the light wave length and the layer thickness,

25X1

angle of refraction, and absorption constant could be determined with good accuracy. In addition, the relationship between the electron emission due to the transmitted light and the wave length and layer thickness were measured. The greatest total emission was found at a layer thickness of approximately 4000 Angstrom, while the most favorable spectral sensitivity distribution similar to the sensitivity of the human eye lay between 10,000 and 12,000 Angstrom, because then the layer acts as a light filter. Until now it was only attempted to attain qualitative, not quantitative, consistent agreement of the spectral characteristic of different cells. Also, the results could not yet be fully utilized in the iconoscope design.

19. Secondary emission was also investigated. However, no systematic investigations were carried out, since enough written material was already available. Essentially, monoscope tubes were made, with television test patterns, some on magnesium foils, and some on aluminum foils. The differences were negligible. 25X1
tubes of this type to the "HF" Werk, Sachsenwerk in Radeberg, and the RFT Funkwerk, Koepenick, since these tubes had not been produced previously in East Germany. design and construction data to the "HF" 25X1
plant.
In connection with the manufacture of these tubes, electron-optical investigations were required. As a result, triode systems with magnetic focussing were chosen. The supericonoscopes produced in connection with these investigations indicated good sensitivity, but their resolution, approximately 400 lines, was not yet sufficient.

20. For the investigation and experimentation with the picture pick-up tubes and monoscope tubes to be produced in this department, a suitable installation of television laboratory equipment was required. This was developed and built in the department itself, as no firm in East Germany was in a position to deliver such an installation.

21. At first a central pulse unit was developed and built for the generation of television synchronisation pulses in accordance with the European Television Standard of the CCIR of July 1950. This pulse unit contains: (a) frequency divider, (b) pulse generator, (c) control oscilloscope for frequency divider and pulse generator, (d) separating stages for line and picture synchronisation pulses, as well as for the synchronisation and scanning pulse combination. The following were also developed and built: (a) monoscope equipment, (b) equipment for the production of an "electric picture", (c) control test pattern, as well as equipment for the measurement of the most important characteristics of picture pick-up tubes, consisting of (a) test camera for a supericonoscope, (b) compensation for the space charge caused by the scanned portion of the test pattern raster in front of the unscanned portion, (c) test oscilloscope with choice of the horizontal or the vertical picture signal. The entire equipment contains approximately 220 tubes, and is mounted in three standard racks.

22. A "photoelectric spectrometer" was also developed and built, to serve as an aid in the manufacture of photocells. It consists of a rotating filter disc, and an oscilloscope. Light falls through the filter disc on the photocell to be tested, and the resulting emission current is amplified and shown on the oscilloscope. With this the spectral sensitivity of the cell may be continuously controlled during the manufacturing process.

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23. Personnel and the projects on which they conducted research were as follows [redacted]: 25X1

Production of Layers:	Dr. WITTKE Ing. APPELT
Measurements and evaluation:	Dr. WEITZENMILLER, [redacted] 25X1 Ing. APPELT
Construction of the system:	THOM WERNER
Development of laboratory equipment:	Ing. FILZ [redacted] 25X1 Ing. PETZELT
Electron-optics:	Dr. GOBRECHT Ing. KABEL
Spectrometer:	Dr. WITTKE Ing. PETZELT

24. In addition, Dipl. Ing. KUENTZELMANN and Dipl. Phys. KUNZE belonged to this department, but they worked under the direction of Prof. HAGENBERG and Dr. EBERHARDT of Buch. [redacted] Dipl. Ing. KUENTZELMANN 25X1 occupied himself with the investigation of the dependence of the outer and inner photo-effects of Sb-Cs layers on temperature. Dipl. Phys. KUNZE worked on photo-conductive layers, primarily of the antimony trisulfide type. In one room of this department SCHMIEGE and HASS, of the Fernsehzentrum, Adlershof, worked on the production of "Multiplyers" (succeeding stages of secondary emission layers); they also tried to make a supericonoscope with electrostatic beam focussing.

25. The equipment of the vacuum laboratory included: six pump stands, one vaporising stand, one Muffelofen (furnace for tempering glass), one vertical sealing machine (Einschmelzmaschine) and several tempering furnaces. The equipment of the optical test laboratory comprised: one double (two-stage) monochromator, one universal spectrograph, one Pulfrich photometer, two mirror galvanometers, two automatic recording writing instruments (Neumann Daempfungsschreiber).

26. The equipment of the apparatus development laboratory included: one oscilloscope with test amplifier, 0 to 20 kc, voltage amplification approximately 100; one standard oscilloscope, made by RFT, with test amplifier, 20 cps to 5 mc, voltage amplification approximately 1000; one signal generator (RFT), 30 kc to 30 mc; one beat frequency oscillator (RFT), 10 cps to 20 kc; one capacitance measuring bridge (RFT), 0.01 to 1 uf; one capacity measuring instrument (RFT), 0.1 to 50 uf; one inductance measuring instrument (RFT), 0.1 uh to 10 mh; two vacuum tube voltmeters, 20 cps to 50 mc, 2/10/50 volts; two vacuum tube voltmeters, 20 cps to 5 mc, 0.1/3/2 volts; two measuring voltage amplifiers (RFT), 20 cps to 200 kc; one high voltage test instrument, 0 to 6 kilovolts rms, 50 cps; one miniature (Kleinbild) projector for iconoscope test camera; one miniature camera (Exakta); various small instruments and multimeters; and an electrolytic vat with associated apparatus. In addition, when Departments IV a and b were fused, the equipment of Department IV a was added to this list.

Department V. Investigation of Magnetic and Dielectric Materials

27. [redacted] this department was concerned with producing magnetic layers for tape recorders, which have particularly good characteristics, particularly with regard to the copy effect. The department was also occupied with infra-red drying, and performed chemical work, such as silver plating, etc., for other departments. This department had two laboratory rooms. 25X1

Department VI. Theoretical Department

28. Dr. HAGEN worked on various mathematical problems, most of which were published. He also occupied himself with the mathematical presentation of detector characteristics and electric potential fields. Dipl. Phys. BLANKENFELD worked on a dissertation on problems in ionospheric instruments.

Planned Development Projects for 1953-54

29. [redacted] The following development projects were applied for by Department IV; they were partly approved and partly rejected by the Planning Ministry: 25X1

a. Investigation of photo-conductive layers - approved with fund of 15,000 DM East.

b. Test apparatus for Vidicon development - approved with fund of 15,000 DM East.

c. Investigation of television transmission characteristics - approved, without funds

d. Focus and deflection system for slow electrons - approved, without funds

e. Beam producing system (electron gun) for slow electrons - so far not approved

f. Narrow film (16 mm) scanner for television - rejected

g. Continuation of the Vidicon development was planned for 1954, as well as work on the problems of color television.

30. In addition, students of the Humboldt University conducted work on the following subjects for diploma theses in Department IV:

a. Hall effect on Sb-Cs layers

b. Optical and electrical characteristics of thin Sb layers

c. Investigations of triode systems in an electrolytic vat.